Statistical Sampling Techniques For Auditors

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Abstrak

Kertas kerja ini bertujuan untuk meninjau kegunaan teknik-teknik persampelan statistikal di dalam bidang pengauditan. Organisasi kini mempunyai dan menguruskan lebih banyak maklumat yang memerlukan pengujian dan penilaian yang lebih meluas. Teknik-teknik yang biasa digunakan tidak lagi begitu sesuai dengan keadaan sebegini sekiranya dibandingkan dengan teknik statistikal. Pengguna maklumat tersebut memerlukan satu pendapat atau pengesahan yang lebih kukuh untuk menjamin kepentingan mereka. Teknik-teknik persampelan yang lebih kukuh. Pada akhir kertas kerja ini, perbincangan diadakan mengenai pendekatan subjektif juruaudit.

Abstract

This paper intends to look into the application of statistical sampling techniques to auditing. As voluminous data extensive testing, the conventional techniques may not be adequate and competence to the statistical method. The user of the data especially the financial statements require more stringent and concrete evidence to evaluate the status of their investment. The objectivity and calculated sampling risk of the statistical method assure a higher degree of confidence in auditor's opinion and a more defensible results. Somehow on the contrary, the Bayesian approach which suggests the auditor's subjective estimate to the population be involved in the evaluation is discussed.

Keywords : Sample, Population, Statistical Sampling

1. Introduction

Business and government have grown in size and complexity. The increase mass of documentation and transactions are confronting the auditors. It is therefore much intricate to protect the interests of the user especially the management and the stake holders. Furthermore, information technology have transform organizations into distributed environment. The data is no longer centralized and reside in one repository, but it is more likely to be geographically dispersed.

The auditors, to whom is responsible for evaluating and report independently to the interested parties, must then acquire skills to audit in such environment. Realizing that computers are used by everyone now, shall pose a greater challenge to the auditors as the credibility of the users and data must be considered.

Information technology has somehow come along to assist the auditors with the emergence of computer assisted audit techniques. This indeed allows the statistical sampling

techniques to more applicable to audit tasks. The auditors then has a higher confidence in expressing his opinion objectively.

1.1Auditing Defined

The American Accounting Association's Committee on Basic Auditing Concepts, in 1972, has defined auditing in its report entitled A Statement of Basic Audit Concepts(ASOBAC) as follows[Ricchiute, 1988, p.4]

> *Auditing is a systematic process of objectively obtaining and evaluating evidence regarding assertions about economics actions and events to ascertain the degree of correspondence between those assertions and established criteria and communicating the results to interested users.*

1.2 Basis Terminology Used in Statistical Sampling

Several terms frequently used in statistical sampling are defined in this sections. The understanding of each of these terminologies is rather important to comprehensively apply the statistical sampling techniques in audit.

A Population is any group of units with some characteristic in common[McRae, 1974, p.11]. Meanwhile, [Wilburn, 1984, p.26] describes the population as the area of which the test is performed to meet the audit objectives. On the other hand, [Sanders et al, 1980, p.115] define population as the total of any kind of units under consideration by the statistician. Hence in auditing, the population is the area that is of interest to the auditors.

A *sample*, on the other hand, is any number of units drawn from a population [McRae, 1974, p.12]. Likewise, a sample is any interested portion of the population selected for study [Sanders et al, 1980, p.115].

An *attribute* according to [McRae, 1974, p.11] is any characteristic which a unit of a population has or does not possess. If the attribute is measurable, it is called the *variable*. Besides, [Wilburn, 1984, p.27] defines the attributes as the qualitative characteristic of set of records or an operating activity.

The confidence level designates the proportion of times the statement about the population is likely to be true in the long run [McRae, 1974, p12]. According to [Wilburn, 1984, p.66], confidence level indicates the degree of assurance that the results of a sample are reasonable estimates of the specific universe characteristics.

Normally, the sample results are subjected to uncertainty because I) only a portion of the population has been examined and ii) there are usually observation and measurement errors. The extent to which the difference between these sample results to the associated universe characteristics is referred to as the *sampling risk*, or the *sampling error* [Wilburn, 1984, p.33-34].

2. Audit Objectives and Statistical Sampling Techniques

Prior to the 1900, the stated audit objective was the detection of fraud and clerical errors. Somehow, there was a transition later, completed only in the late of 1930's, in which the stated objective was the determination of fairness of reported financial status. But later after 1978, the government auditing has indicated the emphasis of the fraud detection or auditing with the establishment of Government Inspectors General [Wilburn, 9184, p.3-4].

The application of statistical sampling in audit activities, therefore, must assist in achieving the audit objectives. Apart from the discussion above, the primary objective of auditing is the issuance of a report which reflects an audit opinion [Wilburn, 1984, p.8]. The public accountants report, in this matter for instance, asserts that the financial auditing standards. Moreover, the public accountants or auditors, express a professional opinion rather than a statement are accurate. Anyhow, the ultimate audit objective is to express a professional informed opinion on particular representations and operations in the audit report.

2.1 Audit Objective and Audit Sample

The success of an audit work may greatly determined by how clear, consistent and precisely the auditors define the objectives and criteria. Statistical sampling imposes an additional discipline on the matter. Thus, different audit objectives will determine different sampling procedures to be applied, and subsequently planned to satisfy those objectives.

The audit objectives may vary among the following factors:

1. verifying the acceptability of a system's operation (occurrence rates),
2. verifying the reasoableness of the value of a set records (inventory), or
3. a search for rare occurrences such as fraud [Wilburn, 1984, p.22]

Ijiri and Kaplan [Wilburn, 1984, p.22] describe four separate and distinct audit testing objectives as illustrated below.

2.2 Estimation Objective

There is probably impracticable to test all transactions with the cost and time constraints. It is then desirable to obtain as close as possible from the sample, the characteristics of the population. In resolving this objective, the judgemental sampling may be involved as the fairness of representation.

Nevertheless, there is no strong evidence that the fairness of representation is achieved. Thereupon, the *estimation sampling* is more appropriate to estimate the characteristics of the population or universe. This is accomplished through the interface from the sample with calculable limits for a specified confidence level. In some instances, this objective is to estimate the overstatement errors, or, on the other hand, to estimate the rate of occurrence of insufficient documentation.

2.3 Correction Objective

The auditor performs corrective auditing in order to locate the maximum number of occurrences or amount of overstated cost. This objective is supported by selecting samples from

the proportions which are errors prone. In this matter, the auditor's knowledge and experience on the operations will possibly select samples with higher error occurrence rate.

Audit stratification, on the other hand, which delimits the population into several proportions with characteristics within each other, promotes the accuracy to find higher deviation rate within each other, promotes the accuracy to find higher deviation rate within the samples selected. Hence, the auditor can easily integrate the statistical approach such as stratified random sampling with the judgemental sampling method to attain the corrective objective.

2.4 Protection Objective

The objective assures that all largest dollar value items are tested as it is intended to maximize the total dollar value of selected sample items. This objective comforts the auditor as the large proportion of the dollar units has been examined. The auditor recognizes that there is the possibility the discrepancies and irregularities may occur in only small portion of population.

Monetary unit sampling is considered a kind of protective sampling. It allows the larger values after a limit to be tested. Furthermore, this method allows a large portion of the population to be examined as it provides a few selection mechanisms.

2.5 Prevention Objective

This objective creates an atmosphere of uncertainty to allows particular transactions to be selected in the future review. It is desirable to conduct random audit testing, but generally with advanced notice to minimize disruption. Apart from the random testing, the auditor may select particular types of transactions to review in subjective approach. This is to ensure no transaction is escaped from testing.

The preventive objective can be considered as psychological sampling as the auditor tries not to follow any pattern. This assures higher representativeness of the sample test, and the statistical random selection just for this purpose.

2.6 Detection Objective

Apart from the four objective of Ijiri and Kaplan, detection or exploratory sampling should be considered. This objective intends to ascertain whether a certain type of occurrence of internal control procedures or evidence of irregularities.

3. The Role of Statistical Sampling

Statistical sampling techniques play an important role in auditing practice. The techniques applied in audit tasks help to determine the strength of internal controls and the fairness of financial statement representation. Traditionally, audit sampling has been categorized into two interconnected areas as the following:

1. *Sampling for compliance test purposes* - This category of test are aim to determine the efficiency of controls especially the internal controls. These tests seldom review the monetary errors in terms of control failure.

2. *Sampling for substantive test purposes* - The emphasis of these substantive test in upon the extent of monetary error. Generally, the population being audited constitutes part of the financial statements.

There have been a number of statistical sampling techniques applied to compliance testing. These techniques are more frequently categorized as "*attribute sampling*", including the I)estimation sampling, ii) acceptance sampling, and iii) discovery sampling.

The auditor tests the hypothesis in estimation sampling so as the error rate is less than some acceptable degree of error. Whereas in acceptance sampling, the auditor seeks the balance between alpha risk and beta risk. The alpha risk, also refer to as type 1 risk, is the risk of sample evaluation rejecting the satisfactorily population. It therefore require supplementary test and involve further audit cost. Meanwhile, beta risk, the type 2 risk, is the risk of sample evaluation accepting the unsatisfactorily population. The risk exposes the auditor to present the misleading audit opinion.

In discovery sampling, the sample size is calculated. The population is accepted as satisfactorily if no error is found. Meanwhile, any error in the sample will automatically reject the population.

More recent developments have emphasize on the techniques for substantive testing. It is in order to give an opinion that the financial statements do not contain any material error. The auditor is thus far required to have high degree of confidence that the financial statements are fairly presented and revealed the truth. Typically, this confidence may be based on the auditor's experience that the financial statements contain no error, or it may be judged from the assessment and testing of the internal control.

Conventional variables sampling like mean per unit estimation examines the population based on the physical units selection. The sample is the physical units selected irrespective of the book value recorded. It is somehow inefficient for the populations, which are highly skewed with very low error rate and skewed error values, which in turn is normally the case.

Monetary unit sampling is a form of attribute sampling that enables a monetary estimate to be made. The sampling unit in this techniques is the individual dollar unit rather that the audit unit. It provides the fair coverage of every dollar unit of the total population. The auditor tests whether the error rate in the population is less than a certain amount. This is typically performed by selecting an initial sample size and the discovery of zero error assures a certain level of confidence that the error rate is not exceeded.

4. Advantages of Statistical Sampling in Auditing

Statistical sampling as practiced in audit task, allows the auditor to exhibits higher competency and assures greater degree of objectivity and accuracy in expressing the opinion to the interested users. The principal advantage of this statistical technique is that it allows the objective means of calculating the sampling risk. This objectivity assures a certain degree of reliability of the opinion of the auditor inferred from the sample result.

Apparently, it is not feasible to examine the total population. Statistical method provides a more economical and efficient way to test a selected portion. Even though this can be carried out by judgemental sampling, it is obvious that statistical method assures a more representative result. Furthermore, the money expenditures increase along with the sample test seemingly when larger sample size is involved. A statistical method is likely to induce a more accurate sample, minimizing the efforts to perform various sample tests.

Meanwhile, the increase of population does not require a longer sample size to be selected as long as is representative. In conjunction, the statistical sampling provides a means of estimating the minimum sample size with a specified risk and precision. Indeed, this precision and risk ensure the sample result to be more defensible.

Besides, statistical sampling provides better audit coverage for a similar audit task as it saves considerable time and cost. In addition, with proper documentation of the sampling plan, it can be executed by different auditors at various locations with a higher degree of consistency. Furthermore, the method does not preclude the use of judgemental sampling as to allow the auditors to exercise their knowledge and experience.

5. Bayesian Approach and Auditing

All the discussion thus far on the sampling techniques are the "classical" methods [McRae, 1974, p.176]. Classical means the inference about the population is based absolutely on the information derived from the sample. The inference is objective as no auditor's experience and intuition have been allowed to bring about the sample results.

Some critics had sought to include the auditor's past experience and intuition to improve the objective inference from the sample. The auditor's subjective beliefs should be acknowledged to assess the objective information on the population under audit.

A branch of statistics called Bayesian statistics has been used in other branches of business activity to associate subjective and objective information into a unified inference. It is also suggested that this approach should be applied to auditing.

As a whole, if the subjective estimates are compiled, it is believed that they can provide a more precise assessment than a qualified opinion. Obviously, the same principle can be applied to auditing. Before an auditor perform an audit task, it is advisable to subjectively estimate some characteristics of the population. For instance, an auditor may estimate the probable error rate that will exceed a given population. This estimate is probably based on auditor's prior experience with the current and other similar populations, the personal intuition and other supplementary knowledge.

The application of statistical method to auditing enables numbers to be attached to evaluations which were previously verbal. That has been achieved by the attached to evaluations which were previously verbal. What has been achieved by the Bayesian approach is that it allows the auditors to attach numbers to his prior beliefs about the likely state of the population. It is thus forces the auditor to clarify his thoughts on what he considers to be normal. The subjective estimate can help the auditors to evaluate the information obtained from the objective sample results.

6. Conclusion

Statistical sampling techniques offer the auditors another approach to auditing. It has to be noticed, somehow, that the application of statistical sampling requires a throughout understanding of the audit tasks and the applicability of the various techniques. The significant point of applying statistical sampling techniques is at first, the auditor must be absolutely clear about the audit objectives. It is only then the appropriate sampling techniques is chosen.

Even though statistical sampling sampling does the does a great favour to the auditors, it has been encouraged that the auditors never ignore the importance of conventional audit approaches. These approaches such as personal judgement are the invaluable tools and techniques that basically help. Somewhere in the middle, it is prosperous to use both the statistical sampling techniques with the auditors' experience in judgmental and heuristic approach.

References

McRae, T.W., *Statiscal Sampling for Audit and Control*, 1974, John Wiley & Sons, Ltd.

Arkin, Herbert, *Handbook of Sampling for Auditing and Accounting*, 1974, McGraw-Hill, Inc.

Willburn, Arthur J., *Practical Statistical Sampling for Auditors*, 1984, Marcel Dekker, Inc.

Gwilliam, David R., *A Survey of Auditing Research*, 1987, The Institute of Chartered Accountants in England and Wales

Ricchiute, David N., *Auditing : Concepts and Standards*, 1988, South-Western Publishing Co.

Sanders, Donald H., Murph, A. Franklin, Eng, Robert J., *Statistics : A Fresh Approach (Second Edition)*, 1980, McGraw-Hill, Inc.